International Journal of Agricultural
Science and Research (IJASR)
ISSN(P): 2250-0057; ISSN(E): 2321-0087
Vol. 6, Issue 6, Dec 2016, 115-122

COMBINING ABILITY ANALYSIS FOR LATE LEAFSPOT RESISTANCE, YIELD AND YIELD COMPONENTS IN GROUNDNUT (*ARACHIS HYPOGAEA* L.)

P SRIVALLI[1], M REDDI SEKHAR[2] & S RAJEEV[3]

[1]*M.Sc (Plant Breeding), Department of Genetics and Plant Breeding, S.V. Agricultural College, Tirupati, Andhra Pradesh, India*

[2] *Professor, Department of Plant Breeding, S.V. Agricultural College, Tirupati, Andhra Pradesh, India*

[3]*M.Sc, Department of Plant Breeding, UAS Dharwad, Karnataka, India*

ABSTRACT

Fifteen F_1 crosses along with eight parents (five lines and three testers) were evaluated for variability, heritability and genetic advance during Kharif, 2011. The analysis of variance for combining ability revealed highly significant difference among the lines, testers and lines x testers for most the characters studied indicating the presence of wide genetic variability among the lines, testers and their interaction effects. The estimates of GCA:SCA variance revealed the predominance of non-additive gene action for all the characters except for number of primary branches per plant, days to 50 per cent flowering and days to maturity. TG-47 and TCGS-888 among the lines while, ICG15234 among the testers were the best general combiners for late leafspot resistance, yield and yield contributing trais while the F1 crosses viz., ICGV-91114 x ICG-15234, TG47 x ICG-15234, TCGS-888 x ICG13919 and TCGS-913 x GPBD-4 were the best specific combinations with mean and specific combining ability in desirable direction for late leafspot resistance, yield and yield contributing trais.

KEYWORDS: Combining Ability, Nature of Gene Action, Late Leafspot Resistance, Groundnut

Received: Sep 29, 2016; **Accepted:** Oct 20, 2016; **Published:** Oct 24, 2016; **Paper Id.:** IJASRDEC201617

Original Article

INTRODUCTION

Groundnut is not only a principal oilseed crop but also a premier nutritious and palatable food crop of India. Even though India occupies the highest area of 4.93 million hectares in the world, China leads in production (15.70 million tonnes) and productivity (3454 kg ha^{-1}), followed by India with a production of 5.64 million tonnes and with a productivity of 1144 kg ha^{-1} (FAO, 2010). The low productivity of the crop in India and several African countries is ascribed to many biotic and abiotic stresses in the cultivation of the crop. Among the biotic factors, late leafspot caused by *Phaeoisariopsis personata* [(Berk. and Curt.) Deighton] is one of the most economically important foliar diseases of groundnut which can causes yield losses up to 80% (Grichar *et al*., 1998). Development of cultivars resistant/tolerant to these diseases could be effective in decreasing the production costs, improving production quality and reducing the detrimental effects of chemicals on our ecosystem. Development of high-yielding foliar disease resistant genotypes requires identification of resistant sources with good breeding potential. Information on genetic control of resistance and yield helps to plan appropriate breeding methodologies to isolate resistant lines with high yield potential.

MATERIALS AND METHODS

The experimental material comprised of 23 genotypes of which five were lines (TPT-4, TCGS-888, TCGS-913, ICGV-91114 and TG-47), three were testers (GPBD-4, ICG-13919 and ICG-15234) and fifteen F_1s derived out of a line x tester design. Crossing was undertaken during *Rabi*, 2010 and 15 F_1s along with their parents were raised in a randomized block design with four replications at Regional Agricultural Research Station, Tirupati during *Kharif*, 2011. Each treatment was sown in one row of 3 m length by adopting a spacing of 30 cm x 10 cm. Observations were recorded on randomly chosen ten competitive plants for characters viz., plant height (cm), number of primary branches per plant, number of secondary branches per plant, number of mature pods per plant, pod yield per plant (g), kernel yield per plant (g), per cent pod set, shelling per cent, harvest index (%), late leaf spot score (LLS) at 90 days after sowing, number of leaves at harvest and number of leaves affected by late leaf spot per plant at 90 days after sowing. The characters viz., days to 50% flowering and days to maturity were recorded on per plot basis. Disease severity for late leaf spot was estimated on plant basis and scoring was done according to 1-9 point field scale (Subramanyam *et al.,* 1982). The score was transformed to percentage using arc-sine transformation (Subrahmanyam *et al.,* 1982). Analysis of variance was carried out as per the method suggested by Panse and Sukhatme (1979). Combining ability analysis in a line x tester design was carried out following the procedure of Kempthorne (1957).

RESULTS AND DISCUSSIONS

The analysis of variance for 14 characters in 23 genotypes revealed that the genotypes were significant for all the characters indicating the existence of sufficient variability in the material studied. Analysis of variance for combining ability revealed significant differences among parents and crosses thus justifying the selection of parents for the study (Table 1). Further, it also revealed highly significant difference among the lines, testers and lines x testers for all the characters studied except number of primary branches per plant in case of lines x testers, indicating the presence of wide genetic variability among the lines, testers and their interaction effects.

Contribution of testers to the total variation was high for the characters viz., number of secondary branches per plant, days to maturity and number of mature pods per plant, whereas the lines contribution to the total variation was high for the characters viz., number of primary branches per plant, days to 50 per cent flowering, harvest index and number of leaves affected by late leafspot per plant at 90 days after sowing (Table 2). The relative contribution of line x tester interaction apportioned greater percentage of the total variation for pod yield per plant, kernel yield per plant, per cent pod set, shelling per cent, late leafspot score at 90 days after sowing and number of leaves at harvest.

The estimates of component variances suggested that the estimate of *sca* variance component was larger than estimate of *gca* variance components for the characters viz., pod yield per plant, kernel yield per plant, percent pod set, shelling per cent, harvest index, late leafspot score at 90 days after sowing, number of leaves affected by late leafspot per plant at 90 days after sowing, number of leaves at harvest indicating the predominance of non- additive gene action for these traits (Table 3). Hence improvement of these yield related traits could be accomplished by selection of crosses having high *sca* effects and advancing progenies to later filial generations.

For plant height, number of secondary branches per plant and number of mature pods per plant, both *gca* and *sca* variance were of equal in magnitude indicating both additive and non-additive gene components of variance were of equal importance. The *gca* variance component for number of primary branches per plant, days to 50 per cent flowering and days

to maturity is more than *sca* variance indicating the importance of additive gene effects for this trait.

Reports of predominance of non-additive gene action for pod yield by Rudraswamy *et al*. (2001), for seed yield by Francies and Ramalingam (1999), for harvest index by Suresh Kumar (1993) were in accordance the findings of present study. Predominance of additive gene action for number of mature pods per plant in groundnut was reported earlier by Nadaf *et al.* (1988) reported. The importance of additivity for number of primary branches per plant was reported earlier by Nadaf *et al.* (1988) and Kalaimani and Thangavelu (1996), for days to 50 per cent flowering by Kalaimani and Thangavelu (1996) and for days to maturity by Basu *et al.* (1987) were in accordance the findings of present study.

Table 1: ANOVA for Combining Ability in a Line x Tester Analysis of 14 Quantitative Traits in Groundnut

Source	df.	Plant Height (cm)	No. of Primary Branches	No. of Secondar y Branches	Days to 50% Floweri ng	Days to Maturity	No. of Mature Pods per Plant	Pod Yield per Plant (g)	Kernel Yield per Plant (g)	Per cent Pod set	Shelling Per cent	Harvest Index (%)	LLS Score at 90 DAS	No. of Leaves at Harvest	Leaves Affected by LLS at 90 DAS
Replications	3	1.13	0.08	0.09	0.30	0.33	0.64	0.93	0.03	11.72	8.40	3.38	0.15	4.23	0.10
Treatments	22	148.38**	2.44**	42.48**	5.37**	25.58**	53.14**	58.85**	12.34**	177.81**	110.30**	206.91**	23.90**	544.27**	159.60**
Parents	7	164.15**	4.52**	67.19**	6.96**	36.25**	39.69**	51.98**	12.52**	134.87**	124.42**	340.45**	60.53**	1198.04**	302.27**
Crosses	14	122.22**	1.57**	32.93**	4.95**	22.03**	45.63**	39.25**	11.72**	210.44**	67.57**	150.46**	1.52**	254.52**	46.00**
Parents vs Crosses	1	404.19**	0.07	3.18**	0.20	0.69	252.44**	381.37**	19.75**	21.53	609.64**	62.27**	80.72**	24.44	751.36**
Lines	4	166.65**	3.38**	25.95**	10.39**	21.60**	11.16**	22.43**	3.84**	62.11**	92.85**	201.34**	1.09**	259.58**	72.85**
Testers	2	289.30**	3.70**	110.95**	7.92**	81.45**	193.49**	98.16**	31.57**	546.89**	57.99**	343.41**	3.43**	498.11**	55.92**
Lines × Testers	8	58.23**	0.14	16.90**	1.48**	7.39**	25.90**	32.93**	10.71**	200.50**	57.32**	76.79**	1.25**	191.09**	30.10**
Error	66	1.25	0.07	0.09	0.24	0.65	0.82	0.62	0.07	13.73	6.24	2.38	0.12	6.82	0.49

** Significant at 1% level of probability, respectively

Table 2: Proportional Contribution of Lines, Testers and Line x Testers Interaction Towards Total Variance in Respect 14 Quantitative Characters in Groundnut

Character	Proportional Contribution (%)		
	Lines	Testers	Line x Tester
Plant height (cm)	38.96	33.82	27.22
No. of primary branches	61.24	33.60	5.16
No. of secondary branches	22.52	48.14	29.34
Days to 50% flowering	60.04	22.87	17.09
Days to maturity	28.02	52.82	19.16
No. mature pods per plant	6.99	60.57	32.44
Pod yield per plant (g)	16.33	35.73	47.94
Kernel yield per plant (g)	9.35	38.47	52.19
Per cent pod set	8.43	37.12	54.44
Shelling per cent	39.26	12.26	48.48
Harvest index (%)	38.23	32.61	29.16
LLS score at 90 DAS	20.44	32.31	47.25
No. of leaves at harvest	29.14	27.96	42.90
Leaves affected by LLS at 90 DAS	45.24	17.36	37.39

Table 3: Magnitude of Components of Genetic Variance for 14 Quantitative Characters in Groundnut

S. No.	Characters	*gca* variance	*sca* Variance	σ^2A	σ^2D	Ratio $\sigma^2A:\sigma^2D$
1	Plant height	14.17	14.24	28.34	14.24	1.99
2	No. of primary branches	0.22	0.02	0.43	0.02	22.85
3	No. of secondary branches	4.27	4.20	8.54	4.20	2.03
4	Days to 50% flowering	0.56	0.31	1.11	0.31	3.60
5	Days to maturity	3.18	1.68	6.36	1.68	3.77
6	No. mature pods per plant	6.34	6.27	12.69	6.27	2.02
7	Pod yield per plant	3.73	8.08	7.46	8.08	0.92
8	Kernel yield per plant	1.10	2.66	2.20	2.66	0.83
9	Per cent pod set	18.17	46.69	36.35	46.69	0.78
10	Shelling per cent	4.32	12.77	8.65	12.77	0.68
11	Harvest index	16.87	18.60	33.75	18.60	1.81
12	LLS score at 90 DAS	0.13	0.28	0.27	0.28	0.94
13	No. of leaves at harvest	23.25	46.07	46.50	46.07	1.01
14	Leaves affected by LLS at 90 DAS	3.99	7.40	7.99	7.40	1.08

Based on the *per se* performance and *gca* effects of parents, TPT-4 was a good general combiner for tall stature plant type, number of primary branches per plant and number of leaves at harvest whereas TCGS-888 was a good general combiner for pod yield per plant and harvest index (Table 4). Similarly, TCGS-913 was found as a good general combiner for less number of leaves affected by late leaf spot per plant at 90 days after sowing, whereas ICGV91114 for early flowering as well as early maturity and shelling per cent and TG-47 for number of secondary branches per plant, number of mature pods per plant, kernel yield per plant, per cent pod set and low late leaf spot score at 90 days after sowing. Among testers, GPBD-4 was found to be a good combiner for improved height whereas ICG-15234 was found to be a good combiner for number of primary branches per plant, number of secondary branches per plant, days to 50% flowering, days to maturity, number of mature pods per plant, pod yield per plant, kernel yield per plant, per cent pod set, shelling per cent, harvest index, late leaf spot score at 90 days after sowing, number of leaves at harvest and number of leaves affected by late leaf spot per plant at 90 days after sowing.

The estimates of *sca* effects of crosses revealed that ICGV-91114 x ICG-15234 was found to be a best specific combination for pod yield per plant, harvest index and less number of leaves affected by late leaf spot per plant at 90 days after sowing (Table 5). Similarly, TPT-4 x ICG-15234 for plant height, TCGS-888 x ICG-13919 for number of mature pods per plant, TCGS-913 x GPBD-4 for kernel yield per plant, per cent pod set, shelling per cent, low late leafspot score at 90 DAS and more number of leaves at harvest, TG47 x ICG15234 for early flowering and early maturity and TCGS-913 x ICG-15234 for number of secondary branches per plant were found to be best specific combiners. The overall picture regarding best performing parents, general combiners together with the crosses showing high *sca* effects for different characters is presented in the Table 6. It is to note that a good performing parent was not always a good general combiner. Furthermore, good general combiners might not necessary always produce good specific combinations for the respective traits. However, it was observed that atleast one good general combining parent was involved in desirable specific combinations with respect to all the characters except for the trait number of leaves at harvest. It was also observed that atleast one high yielding parent was involved in best specific cross

Table 4: Estimates of General Combining Ability Effects of Parents with Respect to 14 Quantitative Characters in Groundnut

Genotype	Plant height (cm)	No. of primary branches	No. of secondary branches	Days to 50% flowering	Days to maturity	No. mature pods per plant	Pod yield per plant (g)	Kernel yield per plant (g)	Per cent pod set	Shelling per cent	Harvest index (%)	LLS score at 90 DAS	No. of leaves at harvest	Leaves affected by LLS at 90 DAS
LINES														
TPT-4	4.65**	0.69**	0.13	0.65**	0.73**	0.19	-0.16	-0.78**	-0.95	-3.90**	-5.10**	0.28**	5.51**	4.17**
TCGS-888	-0.81*	-0.06	-1.63**	0.65**	0.90**	0.49	1.48**	0.16*	-1.18	-1.95**	5.53**	-0.09	-5.01**	-1.55**
TCGS-913	-1.49**	0.09	0.66**	-0.93**	-1.10**	0.02	0.17	0.30**	-2.24*	1.49*	-1.10*	-0.23*	4.37**	-1.76**
ICGV-91114	2.58**	-0.80**	-1.18**	-1.10**	-1.77**	-1.61**	-2.18**	-0.35**	0.81	2.53**	-1.80**	0.36**	-2.67**	0.28
TG47	-4.94**	0.09	2.03**	0.73**	1.23**	0.92**	0.70**	0.66**	3.57**	1.84*	2.46**	-0.31**	-2.21**	-1.15**
SE (g_i)	0.32	0.07	0.09	0.14	0.23	0.26	0.23	0.08	1.07	0.72	0.45	0.10	0.75	0.20
TESTERS														
GPBD-4	3.14**	-0.23**	-2.24**	0.67**	2.25**	-0.36	-0.35	-0.23**	-1.96*	-0.35	1.42**	0.20*	-2.97**	0.38*
ICG13919	1.09**	-0.26**	-0.22**	-0.08	-0.60**	-2.92**	-2.02**	-1.13**	-3.97**	-1.50*	-4.67**	0.27**	-2.79**	1.45**
ICG15234	-4.23**	0.50**	2.46**	-0.58**	-1.65**	3.27**	2.37**	1.36**	5.93**	1.85	3.25**	-0.48**	5.76**	-1.83**
SE (g_i)	0.25	0.06	0.07	0.11	0.18	0.20	0.18	0.06	0.83	0.56	0.34	0.08	0.58	0.16

*, ** Significant at 5% and 1% level of probability, respectively

Combinations for the characters viz., plant height, number of secondary branches per plant, days to 50% flowering, days to maturity, kernel yield per plant, per cent pod set, harvest index, LLS score at 90 DAS and number of leaves affected by LLS at 90 DAS. The crosses possessing high *sca* effects which have one or both the parents with good *gca* can be effectively utilized for obtaining desirable transgressive segregants and could be exploited for practical plant breeding programme (Paroda and Joshi, 1970).

Out of fifteen F_1 crosses, six promising crosses exhibiting more than 30 per cent useful heterosis over the best pure line TCGS-888 and high mean performance for pod yield per plant were listed in the Table 7 along with *per se* performance, *gca* effects of parents and their *sca* effects.

The parents involved in the F_1 cross TG-47 x ICG-15234 (good x good) were good general combiners for pod yield per plant with significant *gca* effects and also registered significant and positive *sca* effect (1.02*) indicating the importance of non-additive gene effects in the heterotic response of this cross for the pod yield which could be exploited through biparental mating or intermating of selects followed by selection in later generations for isolation of high yielding and late leafspot resistant breeding lines.

Among the superior F_1 crosses, TPT-4 x ICG-15234 has recorded non-significant *sca* effect indicating the importance of additive genetic effects in the heterotic response of this cross which could be exploited through simple selection procedures such as mass selection and progeny selection for development of elite breeding lines.

CONCLUSIONS

All the other four crosses involved one or none good general combiners and registered significant and positive *sca* effect for pod yield indicating the importance of non-additive gene effects in the heterotic response of these crosses for the pod yield which could be exploited through biparental mating or intermating of selects followed by selection in later generations. The present study also confirmed that high heterotic combinations were realized in the cross combinations involving the genetically diverse parents (H x L) for pod yield and its components.

Table 5: Estimates of Specific Combining Ability Effects of 15 F_1 Crosses for 14 Quantitative Characters in Groundnut

F_1 Crosses	Plant height (cm)	No. of primary branches	No. of secondary branches	Days to 50% flowering	Days to maturity	No. of mature pods per plant	Pod yield per plant (g)	Kernel yield per plant (g)	Per cent pod set	Shelling per cent	Harvest index (%)	LLS score at 90 DAS	No. of leaves at harvest	Leaves affected by LLS at 90 DAS
TPT-4 × GPBD-4	-5.18**	0.03	-0.33*	0.00	-0.83*	0.77	1.04**	-5.18**	0.03	-0.33*	0.00	-0.83*	0.77	1.04**
TPT-4 × ICG13919	0.80	0.01	-0.47**	0.50**	-0.98*	-1.32**	-1.61**	0.80	0.01	-0.47**	0.50**	-0.98*	-1.32**	-1.61**
TPT-4 × ICG15234	4.39**	-0.05	0.80**	-0.50**	1.82**	0.54	0.57	4.39**	-0.05	0.80**	-0.50**	1.82**	0.54	0.57
TCGS-888 × GPBD-4	0.13	-0.07	2.00**	0.00	0.00	-0.58	0.87*	0.13	-0.07	2.00**	0.00	0.00	-0.58	0.87*
TCGS-888 × ICG13919	-0.42	-0.09	0.31*	0.25	0.85*	3.28**	3.05**	-0.42	-0.09	0.31*	0.25	0.85*	3.28**	3.05**
TCGS-888 × ICG15234	0.30	0.15	-2.32**	-0.25	-0.85*	-2.71**	-3.92**	0.30	0.15	-2.32**	-0.25	-0.85*	-2.71**	-3.92**
TCGS-913 × GPBD-4	3.06	0.08	0.44**	0.08	-1.25**	2.79**	2.81**	3.06	0.08	0.44**	0.08	-1.25**	2.79**	2.81**
TCGS-913 × ICG13919	0.41	0.11	-2.75**	-0.42	1.10**	-1.95**	-2.00**	0.41	0.11	-2.75**	-0.42	1.10**	-1.95**	-2.00**
TCGS-913 × ICG15234	-3.47	-0.20	2.32**	0.33	0.15	-0.84	-0.81*	-3.47	-0.20	2.32**	0.33	0.15	-0.84	-0.81*
ICGV-91114 × GPBD-4	-1.71	-0.23	-0.05	-0.50**	0.67	-3.08**	-3.30**	-1.71	-0.23	-0.05	-0.50**	0.67	-3.08**	-3.30**
ICGV-91114 × ICG13919	3.35**	0.20	0.64**	-0.50**	-0.98**	0.08	0.16	3.35**	0.20	0.64**	-0.50**	-0.98**	0.08	0.16
ICGV-91114 × ICG15234	-1.64	0.04	-0.59**	1.00**	0.32	2.99**	3.14**	-1.64	0.04	-0.59**	1.00**	0.32	2.99**	3.14**
TG47 × GPBD-4	3.71**	0.18	-2.06**	0.42	1.42**	0.09	-1.42**	3.71**	0.18	-2.06**	0.42	1.42**	0.09	-1.42**
TG-47 × GPBD-4	-4.14**	-0.24	2.27**	0.17	0.02	-0.10	0.41	-4.14**	-0.24	2.27**	0.17	0.02	-0.10	0.41
TG-47 × ICG13919	0.43	0.05	-0.21	-0.58**	-1.43**	0.01	1.02*	0.43	0.05	-0.21	-0.58**	-1.43**	0.01	1.02*
SE (S_{ij})	0.56	0.13	0.15	0.25	0.40	0.45	0.39	0.56	0.13	0.15	0.25	0.40	0.45	0.39

*, ** Significant at 5% and 1% level, respectively.

Table 6: Best Parents, General Combiners and F_1 Crosses with the Highest *sca* Effect for 14 Quantitative Characters in Groundnut

S. No.	Character	Best Performing Parents	Good General Combiners	Best Performing cross Combinations	Crosses with Highest *sca* Effect
1	Plant height (cm)	TPT-4 GPBD-4	TPT-4 GPBD-4	ICGV-91114 x ICG13919 TPT-4 x ICG13919	TPT-4 x ICG15234 TG47 x GPBD-4
2	No. of primary branches	TG47 GPBD-4	TPT-4 ICG15234	TPT-4 x ICG15234 TG47 x ICG15234	--
3	No. of secondary branches	TPT-4 ICG13919	TG47 ICG15234	TCGS-913 x ICG15234 TG47 x ICG15234	TCGS-913 x ICG15234 TG47 x ICG13919
4	Days to 50% flowering	TCGS-913 ICG15234	ICGV-91114 ICG15234	ICGV-91114 x ICG13919 TCGS-913 x ICG13919	TG47 x ICG15234 ICGV-91114 x ICG13919
5	Days to maturity	ICGV-91114 ICG15234	ICGV-91114 ICG15234	ICGV-91114 x ICG13919 TCGS-888 x GPBD-4	TG47 x ICG15234 TCGS-913 x GPBD-4
6	No. mature pods per plant	TG47 GPBD-4	TG47 ICG15234	ICGV-91114 x ICG15234 TG47 x ICG15234	TCGS-888 x ICG13919 ICGV-91114 x ICG15234
7	Pod yield per plant (g)	TCGS-913 GPBD-4	TCGS-888 ICG15234	TG47 x ICG15234 ICGV-91114 x ICG15234	ICGV-91114 x ICG15234 TCGS-888 x ICG13919
8	Kernel yield per plant (g)	TCGS-888 GPBD-4	TG47 ICG15234	TG47 x ICG15234 ICGV-91114 x ICG15234	TCGS-913 x GPBD-4 ICGV-91114 x ICG15234
9	Per cent pod set	TPT-4 GPBD-4	TG47 ICG15234	TG47 x ICG15234 ICGV-91114 x ICG15234	TCGS-913 x GPBD-4 TG47 x ICG15234
10	Shelling per cent	TCGS-888 ICG13919	ICGV-91114 ICG15234	ICGV-91114 x ICG15234 TG47 x ICG15234	TCGS-913 x GPBD-4 ICGV-91114 x ICG15234
11	Harvest index (%)	TG47 GPBD-4	TCGS-888 ICG15234	TCGS-888 x GPBD-4 ICGV-91114 x ICG15234-	ICGV-91114 x ICG15234 TCGS-913 x GPBD-4
12	LLS score at 90 DAS	TG47 ICG15234	TG47 ICG15234	TG47 x ICG15234 TCGS-913 x GPBD-4	TCGS-913 x GPBD-4 ICGV-91114 x ICG15234
13	No. of leaves at harvest	ICGV-91114 ICG13919	TPT-4 ICG15234	TPT-4 x ICG15234 TCGS-913 x ICG15234	TCGS-913 x GPBD-4 TCGS-888 x GPBD-4
14	Leaves affected by LLS at 90 DAS	TG47 ICG15234	TCGS-913 ICG15234	ICGV-91114 x ICG15234 TCGS-913 x GPBD-4	ICGV-91114 x ICG15234 TCGS-888 x ICG13919

Table 7: Top Six High Yielding F_1 Crosses Over the Best Pureline (TCGS-888) for Late Leafspot Resistance, Pod Yield and Its Components in Groundnut

S. No	Cross	Mean Grain Yield Per Plant (g)	*gca* Effects		*Sca* Effect
			Female	Male	
1	TG-47 x ICG-15234	22.60	0.70**	2.37**	1.02*
2	ICGV-91114 x ICG-15234	21.85	-2.18**	2.37**	3.14**
3	TPT-4 x ICG-15234	21.30	-0.16	2.37**	0.57
4	TCGS-913 x GPBD-4	21.15	0.17	-0.35	2.81**
5	TCGS-888 x ICG-13919	21.03	1.48**	-2.02**	3.05**
6	TCGS-888 x GPBD-4	20.53	1.48**	-0.35	0.87*

REFERENCES

1. ***FAO 2010*** *Statistical data on crops, groundnut, area, production and productivity of India & World, 2010. http://faostat.fao.org/ site/567/default.aspx.#ancor.*
2. ***Grichar, W.J., Besler, B.A., and Jaks, A.J. 1998*** *Peanut (Arachis hypogaea L.) cultivar response to leafspot disease development under four disease management programs. Peanut Science, 25: 35-39.*
3. ***Panse V G and Sukhatme P V 1979*** *Statistical methods for Agricultural workers. ICAR Publication, New Delhi.*
4. ***Subrahmanyam P McDonald D Gibbons R W Nigam S N and Nevill D J 1982*** *Resistance to rust and late leaf spot diseases in some genotypes of Arachis hypogaea. Peanut Science, 9: 6-10.*
5. ***Kempthorne, O. 1957****. An Introduction to Genetic Statistics. John Wiley and Sons Inc., New York.*
6. ***Rudraswamy, P., Nehru, S.D and Kulkarni, R.S. 2001****. Combining ability studies in groundnut. Mysore Journal of Agricultural Sciences. 35(3): 193-202*
7. ***Francies, R.M and Ramalingam, S. 1999****. Combining ability in groundnut. Legume Research. 22(4): 267-269.*
8. ***Suresh Kumar, S. 1993.*** *Studies on combining ability, variability and interrelationships in 15 F_3 Progenies of 6 x 6 diallel of groundnut (Arachis hypogaea L.). M.Sc. (Ag). Thesis Andhra Pradesh Agricultural University, Hyderabad.*
9. ***Nadaf, H.L., Habib, A.F., Patil S.S and Sadaqat, S. 1988.*** *Heterosis and combining ability studies in Groundnut. Journal of Oilseeds Research. 5: 7-15.*
10. ***Basu, M.S., Vaddoria, M.A., Singh, N.P and Reddy, P.S. 1987.*** *Combining ability for yield and its components in a diallel cross of groundnut. Indian Journal of Agricultural Sciences. 57(2): 82-84.*
11. ***Kalaimani, S and Thangavelu, S. 1996.*** *Combining ability studies in Groundnut. Madras Agricultural Journal, 83(1): 691-693.*